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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/749,833	12/30/2003	John C. Batterton	09991-151001	9382

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P.O. BOX 1022  
MINNEAPOLIS, MN 55440-1022

EXAMINER
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MRUK, GEOFFREY S

ART UNIT	PAPER NUMBER
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2853

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/14/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

**Office Action Summary**

Application No.

10/749,833

Applicant(s)

BATTERTON ET AL.

Examiner

Geoffrey Mruk

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 19 December 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-3, 5-15, 17-20 and 22-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5-15, 17-20 and 22-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 May 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 19 December 2003 has been entered.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

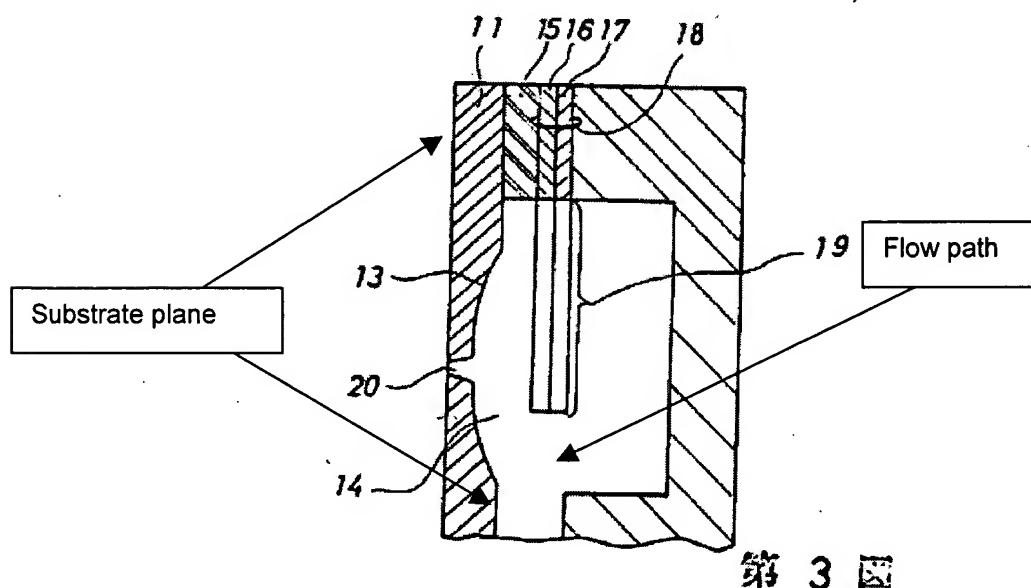
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 3, 5, 9, 11, 12, 15, 19, 20, 24, and 26 are rejected under 35 U.S.C. 102(b) as being anticipated by Yonekubo (JP 2-4515).

With respect to claim 1, Yonekubo discloses a drop ejector (Fig. 1, element 9), comprising:

- a flow path (Fig. 3, below) in which fluid (Fig. 3, element 14) is pressurized to eject drops from a nozzle opening (Fig. 2, element 20) formed in a substantially planar substrate (Fig. 3, element 11) and lying in plane defined by a surface of the substrate (Fig. 3 below);

- a radial channel (Fig. 4, element 12) formed in the substrate proximate the nozzle opening, the radial channel having dimensions configured to and being spaced from the nozzle opening a distance to draw fluid into the space defined by the radial channel, a portion of the radial channel being below the plane defined by the surface of the substrate (Fig. 3 below); and
- at least one connecting channel (Fig. 4, element 13) formed in the substrate (abstract) and extending from the radial channel, the connecting channel being configured to move fluid away from the nozzle opening (abstract).



With respect to claim 2, Yonekubo discloses a drop ejector, comprising:

- first and second flow paths (Figs. 3 and 4, i.e. array of each element) in which fluid (Fig. 3, element 14) is pressurized to eject drops from first and second nozzle openings (Fig. 2, element 20) formed in a substantially planar substrate

(Fig. 3, element 11) and lying in a plane defined by a surface of the substrate (Fig. 3 above);

- first and second radial channels (Fig. 2, array of element 12) formed in the substrate proximate the respective first and second nozzle openings (Fig. 2, element 20), the channels having dimensions and being spaced from the nozzle openings a distance configured to draw fluid into the space defined by the radial channels (abstract), a portion of the radial channels being below the plane defined by the surface of the substrate (Fig. 3 above); and
- first and second connecting channels (Fig. 2, element 13) formed in the substrate and extending from the first and second radial channels, and a third connecting channel (Fig. 2, array of element 13) connecting the first and second radial channels, the connecting channels being configured to move fluid away from the nozzle opening (abstract).

With respect to claim 3, Yonekubo discloses first and second channels (Fig. 2, array of element 12) are in the shape of a circle.

With respect to claim 5, Yonekubo discloses the radial channel (Fig. 2, element 12) has a width that is about twice the nozzle opening (Fig. 2, element 20) width or less.

With respect to claim 9, Yonekubo discloses the planar substrate (Fig. 3, element 11) includes a plurality of nozzle openings (Fig. 2, array of element 20) and radial channels (Fig. 2, array of element 12) proximate the nozzle openings.

With respect to claim 11, Yonekubo discloses a piezoelectric actuator (Fig. 3, elements 18, 19).

With respect to claim 12, Yonekubo discloses a method of fluid ejection (Fig. 1), comprising:

- ejecting a drop through the nozzle opening (Fig. 2, element 20) formed in a substrate (Fig. 3, element 11) and lying in a plane defined by a surface of the substrate (Fig. 3 above);
- positioning a radial channel (Fig. 4, element 12) in the substrate proximate the nozzle opening;
- providing at least one connecting channel (Fig. 4, element 13) in the substrate, the connecting channel extending from the radial channel;
- drawing fluid into the radial channel during fluid ejection, the fluid moving from the radial channel into the connecting channel (abstract), a portion of the radial channel being below the plane defined by the surface of the substrate (Fig. 3 above).

With respect to claim 15, Yonekubo discloses the radial channel (Fig. 4, element 12) is spaced from the nozzle opening (Fig. 4, element 20) by a distance of about 20% of a nozzle width or more.

With respect to claim 19, Yonekubo discloses fluid is drawn into the space defined by the radial channel (Fig. 4, element 12) during jetting (abstract).

With respect to claim 20, Yonekubo discloses the radial channel (Fig. 4, element 12) is spaced from the nozzle opening (Fig. 4, element 20) by a distance of about 20% of a nozzle width or more.

With respect to claim 24, Yonekubo discloses the fluid (Fig. 3, element 14) is drawn into the radial channel by capillary forces (abstract).

With respect to claim 26, Yonekubo discloses fluid (Fig. 3, element 14) is drawn into the space defined by the radial channel (Fig. 4, element 12) during jetting (abstract).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 6, 7, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yonekubo (JP 2-4515) in view of Louzil (US 4,422,082).

With respect to claims 6, 7, and 10 Yonekubo discloses the radial channel (Fig. 4, element 12) and the nozzle opening (Fig. 3, element 20).

However, Yonekubo fails to disclose:

- the radial channel has a width of about 100 microns or less,
- a depth of the radial channel is from about 2 microns to about 50 microns, and
- discloses the nozzle opening width is about 200 microns or less.

Louzil discloses a jet nozzle plate for an ink jet print head where

- the radial channel has a width of about 100 microns or less (Column 4, lines 24-29),

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- a depth of the radial channel is from about 2 microns to about 50 microns (Column 4, lines 32-34), and
- the nozzle opening width is about 200 microns or less (Column 4, line 9).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use the teachings of Louzil for the ink jet head of Yonekubo. The motivation for doing so would have been "a jet nozzle plate of this kind can be very accurately manufactured" (Column 1, lines 61-62).

2. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yonekubo (JP 2-4515) in view of Hawkins et al. (US 6,258,286 B1).

With respect to claim 8, Yonekubo discloses the drop ejector (Fig. 1, element 9).

However, Yonekubo fails to disclose the substrate is silicon material.

Hawkins discloses making ink jet nozzle plates, where the substrate is silicon material (Column 4, line 14).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use the teachings of Hawkins for the substrate of Yonekubo. The motivation for doing so would have been "ink jet nozzles for ink jet print heads are effectively provided with simplified micromachining processes. It is particularly advantageous in the manufacture of very small or critically dimensioned ink jet nozzle plates to take advantage of silicon processing technology at all possible steps of the process" (Column 3, lines 1-5).

3. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yonekubo (JP 2-4515) in view of Held (US 5,853,861).



With respect to claims 13 and 14, Yonekubo discloses the method of fluid ejection (Fig. 1).

However, Yonekubo fails to disclose the fluid having a surface tension of about 20-50 dynes/cm, and the fluid having a viscosity of about 1 to 40 centipoise.

Held discloses "pigmented ink jet inks suitable for use with ink jet printing systems should have a surface tension in the range of about 20 dyne/cm to about 70 dyne/cm" (column 5, lines 45-49) and an "acceptable viscosity is no greater than 20cP" (Column 5, lines 49-50).

At the time of the invention, it would have been obvious for one of ordinary skill in the art to use the teachings of Held for the ink jet print head of Yonekubo. The motivation for doing so would have been the "ink has physical properties compatible with a wide range of ejecting conditions" and "The inks have excellent storage stability for a long period and do not clog in an ink jet apparatus. Further, the ink does not corrode parts of the ink jet printing device it comes in contact with, and it is essentially odorless and non-toxic" (Column 5, lines 51-60).

4. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yonekubo (JP 2-4515) in view of Kobayashi et al. (US 5,898,444).

With respect to claims 17 and 18 Yonekubo discloses the drop ejector (Fig. 1, element 9).

However, Yonekubo fails to disclose a vacuum source in communication with the connecting channel and a wicking material in communication with the connecting channel.

Kobayashi discloses an ink jet type recording apparatus having a capping device where "The cap member 13 adapted to seal the black ink recording head 7 is designed as follows: A cup is formed with elastic material such as rubber, the air communication hole and ink suction hole 54 are formed therein as shown in FIG. 4, and tubular paths 57 and 58 are formed therein which are connected to connecting mouths 50 and 51 of the slider 20. In addition, an ink absorbing sheet 59 is set in the bottom" (Column 6, lines 9-15).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use the teachings of Kobayashi for the ink jet print head of Yonekubo. The motivation for doing so would have been "in the apparatus, negative pressure is provided by a suction pump and applied to the capping means, so that the ink is forcibly discharged from the recording head, to eliminate the clogging of the recording head" (Column 2, lines 46-50).

5. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yonekubo (JP 2-4515) in view of Bentin (US 4,413,268).

With respect to claim 25, Yonekubo discloses the method of fluid ejection (Fig. 1).

However, Yonekubo fails to disclose:

- the fluid is drawn into the radial channel by gravity.

Bentin discloses a jet nozzle for an ink jet printer where "The excess ink in the troughs 6 is discharged through the channels 7. This situation is shown in FIG. 6b"

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(Column 5, lines 19-21). Capillary action or capillarity is the ability of a narrow tube to draw a liquid upwards against the force of gravity.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use the teachings of Bentin for the ink jet print head of Yonekubo. The motivation for doing so would have been "after-flow of the residual ink in the jet nozzle channel after ejection is considerably reduced, which renders it possible to considerably increase the ejection rate" (Column 3, lines 30-33).

### ***Conclusion***


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Geoffrey Mruk whose telephone number is 571 272-2810. The examiner can normally be reached on 7am - 330pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Meier can be reached on 571 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

GSM  
3/8/2007



**STEPHEN MEIER**  
**SUPERVISORY PATENT EXAMINER**